Quantitative Research Design

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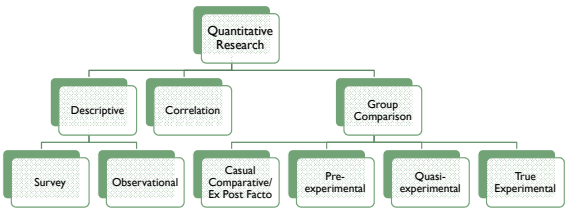
Research Design

- A research design is a plan that guides the decision as to:
  - when and how often to collect data
  - what data to gather and from whom
  - how to analyze the data
  - Examines linkage, causation, or relationships

Quantitative Research: Types (Campbell & Stanley, 1963; Crowl, 1993)



Additional Designs

Instrument Development

- Developing an instrument and conducting statistical analysis for validity and reliability is a quantitative study.

Document/ Content Analysis

- Analyzing communication, such as discussion forums, lesson plans, websites, a quantitative content analysis may be an appropriate choice. It is an empirical method for analyzing communication in a systematic manner.

Single Subject Design

- This design is similar to a time series design and each participant serves as their own control and is observed repeatedly. Usually a baseline is established by observing a participant prior to the treatment. Then treatment is introduced and behavior is observed.

Research Design
Descriptive- "What is"

- Purpose
  - The aim of descriptive studies is to understand what is in a specific situation with an identified population.
  - Descriptive studies are often used to gain knowledge to identify a problem for further, more sophisticated research.
- Example Questions:
  - What is the attitude of school counselors about the use of Response to Intervention (RtI)?
  - What responsibilities do school counselors have in RtI as implemented in their school?

Research Design
Descriptive- "What is"

Survey

- a written document, an online questionnaire, a face-to-face interview, or a telephone interview.
- There 2 basic kinds of survey research:
- **Longitudinal designs** include the study a population over a period of time. This includes trend studies, cohort studies, and panel studies.
- **Cross sectional designs** include the study of individuals (usually an attitude or belief) at one point in time.

Observational

- the process of observing to gather data on which to base a conclusion.

Research Design
Causal-Comparative (Ex Post Facto)

Purpose

- To examine the possible cause and effect relationship between variables that exist.
- To study a phenomena after the fact; that is, after it occurred naturally or was already manipulated.
- Chosen by a researcher in order to gain information about a phenomena in which little is known.
- It also used when the researcher finds it too difficult, unethical, or impossible to manipulate the independent variable.
- And, although you will note that a causal-comparative design, is almost identical to a pre-experimental design, it is considered more creditable as long as selection threats to validity are addressed and different groups that are studied are as homogeneous as possible on all variables except the one under study.

Questions

- Is there a difference in male and female university students' social presence while participating in a 8 week online course?

Research Design
Causal-Comparative (Ex Post Facto)

Like descriptive studies, the researcher does not attempt to manipulate or exert control over the phenomenon being studied.

Unlike descriptive studies, the researcher does seek to examine a possible cause and effect relationship between variables; thus, there is an independent or dependent variable.

Note that I said "possible" cause and effect.

Research Design
Correlational

Purpose

- To examine the extent to which two or more variables relate to one another.
- The researcher cannot make statements about any cause and effect relationships because he or she does not know the direction of the cause and cannot guarantee that another variable in not influencing the relationship between variables.
- Used as exploratory or beginning research to determine if more rigorous research is warranted.
- If a correlational design is chosen, the researcher needs to ensure that a theoretical or conceptual rationale for each variable under study is presented.

Questions.

- Is there a relationship between high school GPA and College Board SAT scores?
- Do SAT scores can predict college while controlling for gender?

Research Design
Experimental

Campbell and Stanley (1963) purported that there are 3 types of experimental studies:

- Pre-experimental
- True experimental
- Quasi-experimental

- The distinguishing characteristic of all experimental designs is the researcher's manipulation of the independent variable.

Research Designs

- In the examples we discuss, the following key will be used. This is the key commonly used in research texts and is taken from Campbell and Stanley (1963):
  - X= exposure to an experimental treatment
  - O = represents an observation or measurement in the design diagrams.
  - Multiple rows reflect multiple groups.
  - R = the group or groups are formed by a random assignment procedure

Research Design
Pre-Experimental

Purpose

- To obtain preliminary research data to determine the effectiveness of an intervention or treatment.
- Pre experimental designs are weak in structure and control. In fact, Campbell and Stanley (1963) say that these designs have little value.
- Pre-experimental designs are distinguished as separate from quasi experimental design in some research texts and not in other. For example, Campbell and Stanly (1963) identify them as a type of experimental design, but Borg, Borg, and Gall (2003) do not.

Question

- Does parents' scores on the Parenting Skill Assessment increase after participation in the Successful Parenting Program?

Research Design
Pre-Experimental

Example pre-experimental designs include:

- One shot Case Study
  - X O
- One Group Pretest-Post
  - O X O
- Post Test Only Non-equivalent Group Design
  - X O
  - O

Research Design
Quasi- Experimental

Purpose

- To determine the causality of an intervention or treatment with the target population.
- Allow the researcher to control the treatment, but they do not in…le the random assignment of participants.
- Used because they are often more convenient and less disruptive than a true experimental design.
- Chosen when it is impossible to conduct a true experimental design.

Question

- What effect does participation in a math lesson developed using problem based pedagogy have on second grade students' math achievement scores when compared to participation in a a math lesson developed using traditional pedagogy?
- Mrs. Smith class, which has been formed, would receive a lesson developed using problem based pedagogy. Mr. Jones' class, which has been formed, would receive a lesson developed using traditional pedagogy

Research Design
Quasi-Experimental

- **Example quasi-experimental designs include**
- Interrupted time-series design
  - O O X OO
  - OO OO
- Nonequivalent group design
  - O X O
  - O O
- Counterbalanced design
  - X(1)O X(2)O X(3)O
  - X(2)O X(3)O X(1)O
  - X(3)O X(2)O X(1))

- **2characteristics**
  - Manipulation
  - Control

Research Design
Quasi- Experimental

Different types of control groups. (Kazdin , 2003):

- No-treatment control groups
- Waiting-list control groups
- No-contact control groups
- Non-specific treatment control groups
- Routine or standard treatment control groups
- Yoked control groups
- Nonequivalent control groups

3 factors to consider when choosing the type of control(Kazdin, 2003, p. 200):

- The intent of the research study,
- Previous research, and
- Ethical and practical considerations.

Research Design
True Experimental

Purpose

- To examine the cause and effect relationship between variables.
- To investigate possible cause-and-effect relationships by exposing one or more experimental groups to one or more treatment conditions and comparing the results to one or more control groups not receiving the treatment.
- According to Campbell and Stanley (1963), the experimental design controls for most threats to internal validity. It is considered the most rigorous design.

Question:

- Is there a difference in students' social presence (SP), cognitive presence (CP), teaching presence (TP), and perceived learning based upon the type of CMC system used in the online courses?
- Does the type of CMC system used in the online courses effect online graduate students' sense of community?

Research Design
True Experimental

- **Example true experimental designs include:**
- Post test only design
  - R X O
  - R O
- Pre test Post test equivalent group design
  - RO X O
  - RO O
- Solomon four
  - R X O
  - R O
  - RO X O
  - RO O

- **3 characteristics**
  - Manipulation
  - Control
  - Randomization

Research Design
Choosing a Design

- Am I concerned with relationship or difference between variables?
- Will I manipulate the independent variable?
- Will I use a control group?
- Will my subjects be randomly assigned?
- Which design is feasible and best controls for threats to internal validity?

Application

Identify Your Research Design

Justify your research design (Use the literature to support this)

Examples

- An example of such a design is described in a dissertation by Sangster (1991): An experimental, 2 x 2 factorial, pretest-posttest design was used to test the hypothesis. The independent variables were (a) training type and (b) management experience. Respective levels of independent variables were descriptive and prescriptive training, and high and low management experience. (p. 102)
- A dissertation by Macdonald (1990) examined the relationships among empathy, personal maturity, and emotional articulation. Macdonald described her design as follows: The research design was a correlational design utilizing cross-sectional survey methodology and includes a number of survey instruments. The purpose of the design was to correlate the scores of the personality tests listed below with the scores on responses to the short stories, as well as measure the interrelationship of the responses to the short stories. (p. 115)